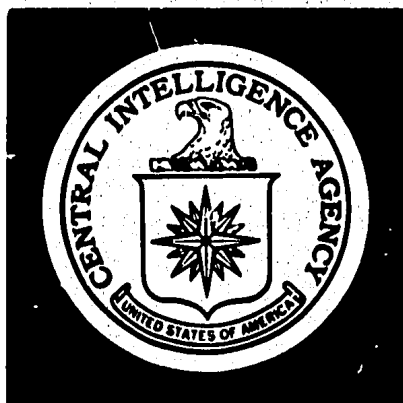


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**DIRECTORATE OF
INTELLIGENCE**

Intelligence Memorandum

Ghana's Volta River Project: A Limited Success

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
March 1971

INTELLIGENCE MEMORANDUM

Ghana's Volta River Project: A Limited Success

Introduction

After decades of planning, four years of construction, and five years of operation, Ghana's Volta River Project, one of the largest development efforts ever undertaken in tropical Africa, has yet to fulfill the high expectations of its sponsors. The Project has been held up to the Ghanaians as a major vehicle to advance an economy long subject to the vagaries of the world cocoa market and, more recently, weighted down by former president Nkrumah's legacy of debt. The original plan envisioned developing hydroelectric facilities, exploiting Ghana's large bauxite reserves, and producing aluminum. In addition, the project was to stimulate light industry, to diversify agriculture through irrigation, and to expand fishing on the newly formed lake. This memorandum sets forth the actual accomplishments of the Volta River Project and assesses its present and potential contribution to Ghana's economy.

Economic Setting

1. For decades, Ghana's economy has been based on exporting agricultural and mineral commodities. The basic export commodity is cocoa,

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of which Ghana is the world's leading producer. Mineral output consists chiefly of gold, manganese, industrial diamonds, and bauxite. Under British administration, exports were sufficient to accumulate some \$500 million in foreign exchange reserves. At independence in 1957, therefore, Ghana's economic prospects were considered bright.

2. By the mid-1960s, however, Ghana found itself in the midst of serious economic troubles from which it has not yet fully emerged. Its first president, Kwame Nkrumah, engaged in unchecked spending adventures, including devoting a large proportion of the country's resources to an attempt to industrialize rapidly. Furthermore, world cocoa prices, on which Ghana depended for more than 60% of its export receipts, fluctuated an average of 20% annually during 1960-67. By 1965, Nkrumah's policies had sapped Ghana of its foreign exchange reserves and had left the country with a foreign debt of almost \$800 million.*

3. Nkrumah's successors embarked on an economic stabilization program, which has involved tight control over wages, prices, and imports as well as a 30% currency devaluation in July 1967. Because of this austerity program, Ghana now faces high unemployment and a shortage of imports needed for development. At the same time, per capita income is stagnant and private foreign investment has been low.

4. Against this background, the Volta River Project, Ghana's largest developmental undertaking, has been regarded as a springboard for economic advance. Planners envisioned large foreign exchange earnings, once electricity from the project became available, through developing an integrated bauxite-alumina-aluminum industry** using extensive domestic bauxite ores. In

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*** Bauxite is a clay-like ore from which aluminum is obtained; alumina (aluminum oxide) is an intermediate product used in the manufacture of aluminum metal.*

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addition, the relatively low-cost electricity was expected to attract light industry and to offer the possibility of irrigating the rain-poor Accra Plains, permitting diversification into sugar cane or rice.

The Volta River Project

5. The possibility of harnessing the Volta River had long been recognized. In the early 1950s, when there was an acute world aluminum shortage, the British proposed developing an integrated bauxite-alumina-aluminum industry. After independence the charismatic Nkrumah won the support of the United States and other foreign governments, the World Bank, and two private US aluminum firms for a major project to develop hydroelectric and aluminum facilities.

6. The project was aligned into two financial entities, a hydroelectric development managed by a Volta River Authority (VRA) in the public sector and an aluminum company, called the Volta Aluminum Company (VALCO), in the private sector. For the VRA, Ghana obtained long-term loans of \$47 million from the World Bank, \$30 million from the United States, and \$4 million from the United Kingdom. Together these sources provided more than one-half of the \$150 million cost of the power project, with Ghana providing the balance as an equity investment.* Kaiser Aluminum and Chemical Corporation supplied 90% of the initial capital of \$32 million to inaugurate VALCO, and Reynolds Aluminum Company provided the balance; the US Export-Import Bank loaned VALCO \$96 million needed later to complete the aluminum smelter (see Table 1).

* Initial loan extensions were \$37 million and \$14 million from the United States and the United Kingdom, respectively. Completion of the Akosombo dam and associated township in four years, instead of the anticipated five, as well as cheaper than expected materials costs saved Ghana \$46 million in construction costs from an earlier projected cost estimate of \$196 million. As a result the external loans were not entirely utilized.

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Table 1
Sources of Financing for the Volta River Project

	Million US \$						
	<u>United States</u>	<u>United Kingdom</u>	<u>World Bank</u>	<u>Ghana</u>	<u>Kaiser-Reynolds</u>	<u>Total</u>	
<i>Present facilities</i>	126.2	3.5	46.9	69.9	32.0	278.5	
Volta River Authority	<u>30.2</u>	<u>3.5</u>	<u>46.9</u>	<u>69.9</u>	-	<u>150.5</u>	
Dam, powerplant, and generating facilities	23.2	3.5	39.9	41.0	-	107.6	
Transmission network	7.0	-	7.0	10.8	-	24.8	
Other <u>a/</u>	-	-	-	18.1	-	18.1	
VALCO smelter	<u>96.0</u>	-	-	-	<u>32.0</u>	<u>128.0</u>	
	<u>United States</u>	<u>Canada</u>	<u>World Bank</u>	<u>Ghana</u>	<u>Kaiser-Reynolds</u>	<u>Barclay's Bank</u>	<u>Total</u>
<i>Future expansion</i>	11.2	5.4	6.0	5.6	8.5	5.0	41.7
Volta River Authority	<u>0.7</u>	<u>5.4</u>	<u>6.0</u>	<u>5.6</u>	-	-	<u>17.7</u>
Two additional turbines	0.7	5.4	6.0	2.2	-	-	14.3
Togo-Dahomey network	-	-	-	3.4	-	-	3.4
VALCO expansion	<u>10.5</u>	-	-	-	<u>8.5</u>	<u>5.0</u>	<u>24.0</u>

a. Akosombo township; other land, buildings, plant equipment, and furniture; and resettlement of 70,000 inhabitants of land innundated by Lake Volta.

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7. The Akosombo dam on the Volta River has been in operation since late 1965 and the VALCO aluminum smelter at Tema since early 1967 (see Figures 1, 2, and 3). The \$150 million Volta hydroelectric facility includes four generating units with installed capacity of 588 megawatts (mw),* ranking it third in capacity among existing African power installations (after Aswan and Kariba).** The \$128 million VALCO smelter, Africa's largest primary aluminum producer -- 125,000 tons*** in 1969 -- has more than twice the output of Africa's second largest producer (the ALUCAM smelter in Cameroon) and about 1% of total world output. By late 1972 the capacity of the Akosombo dam will be increased by 50% with financing from both foreign and Ghana government funds (see Table 1). In the same year, VALCO expects to boost capacity to 162,000 tons per year, making it the largest primary aluminum producer in the developing world.

Economic Impact of the ProjectGeneral

8. The Volta River Project has been of significant value to Ghana's economy, but the benefits have fallen far short of expectations held when the project was initiated. Foreign exchange and tax earnings from the project have been small, and, although they are expected to increase rapidly in the 1970s, they will not relieve Ghana's foreign exchange problem. Industrial development based on cheap power has been only moderate, and the vast irrigation potential

* 588 mw represents an overload capability; 512 mw is the expected capacity based on the regulated flow of the Volta River.

** The Cabora-Bassa project in Mozambique, now under construction, has a planned capacity of 1,200 mw in the first stage, which is scheduled for completion in 1975.

*** All tonnages in this memorandum are in short tons.

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FIGURE 1

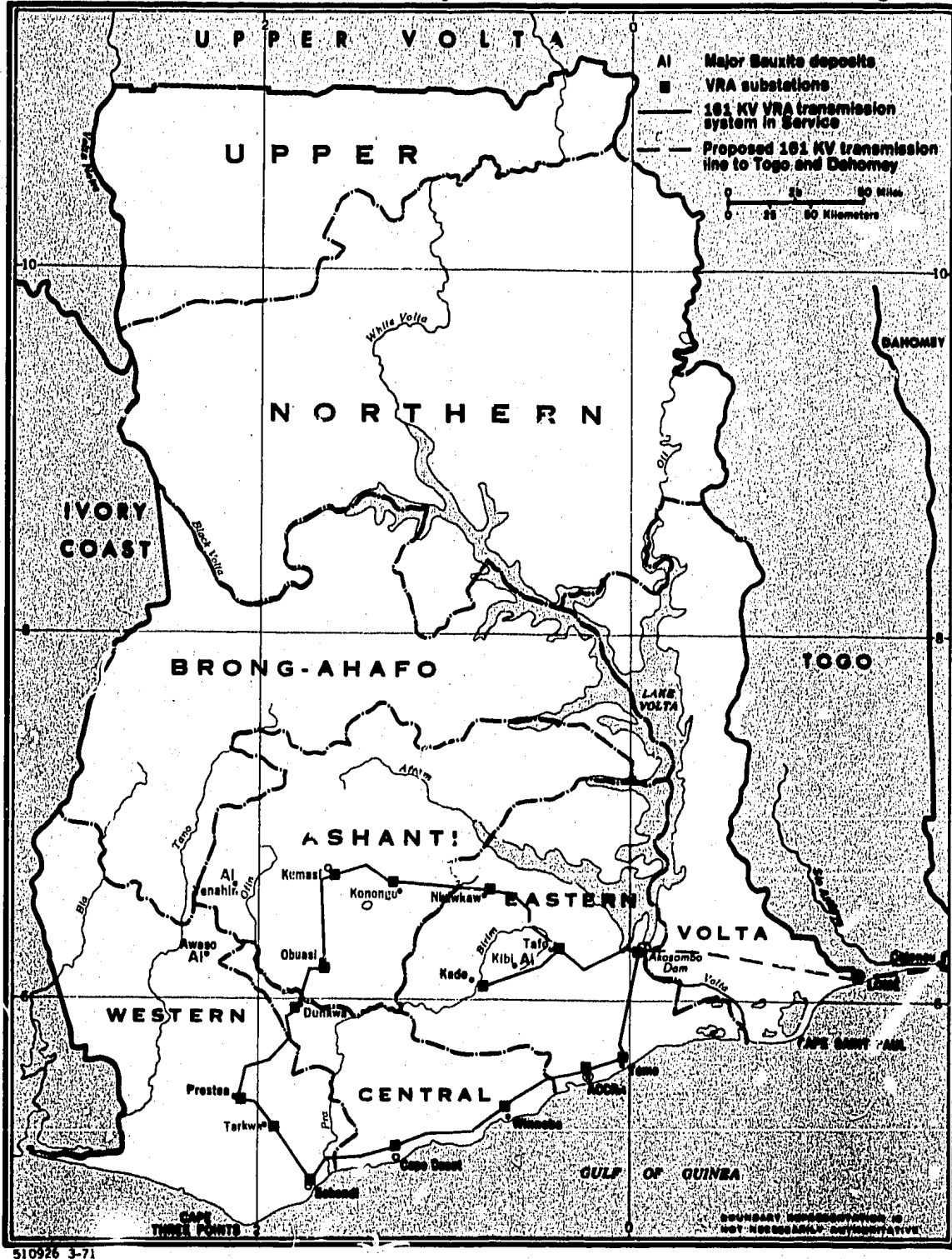


**THE AKOSOMBO DAM, AFRICA'S THIRD LARGEST
HYDROELECTRIC INSTALLATION**

FIGURE 2



**THE VALCO SMELTER AT TEMA, LARGEST PRODUCER OF
PRIMARY ALUMINUM IN AFRICA**

CONFIDENTIAL**Major Bauxite Deposits and Main Hydroelectric Facilities****Figure 3****CONFIDENTIAL**

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has yet to be tapped. Because the world bauxite market is soft, alumina for the aluminum smelter is imported instead of being obtained from domestic bauxite, which would be expensive to develop. Low Ghanaian government earnings result partly from the extremely low rates for power paid by the smelter -- a reflection of the aluminum companies' favorable bargaining position.

Current Economic Benefits

9. The foreign exchange gains to Ghana from the Volta River Project are now about \$8 million a year. These come entirely from VALCO. The smelter pays more than \$5 million in foreign exchange for Akosombo power; the balance comes from purchases of local currency to pay the 1,600 Ghanaians employed in the smelter and to pay for operating and maintenance supplies on the local market (see Figure 4). VALCO's export earnings of \$70 million a year accrue entirely to Kaiser and Reynolds.

10. The government also depends on sales of VRA electricity to purchasers other than VALCO. Only 30% of VRA power production is consumed outside of VALCO, but these consumers provided half of total electricity revenues in 1969 and almost all of the VRA's profits (see Figure 5). The Electricity Corporation of Ghana (ECG), distributors of VRA power in southern Ghana, purchased \$3.7 million of Volta electricity in 1969 and accounted for 36% of revenue. In the same year, Ghana's mines, which placed 36 mw of diesel facilities on standby and switched to Volta electricity in 1965, paid VRA \$1.3 million and accounted for 12% of revenues. Electricity supplied to the town of Akosombo accounts for the remaining 2% of revenues. Profits in 1969 on revenue of \$10.4 million were less than \$1 million (see Figure 4).

11. Ghana has also benefited from damming the Volta River at Akosombo. The 3,275 square mile lake, the world's fourth largest manmade body of water, provides a north-south route, thereby extending the possibilities of commerce with remote interior regions of Ghana. The inland fishing industry made possible by Lake

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Volta, after slow initial development, has become a major source of domestic fish, producing 25,000 tons worth \$10 million -- one-third of the domestic catch -- in 1969.

Frustrated Expectations**Losses in Bargaining**

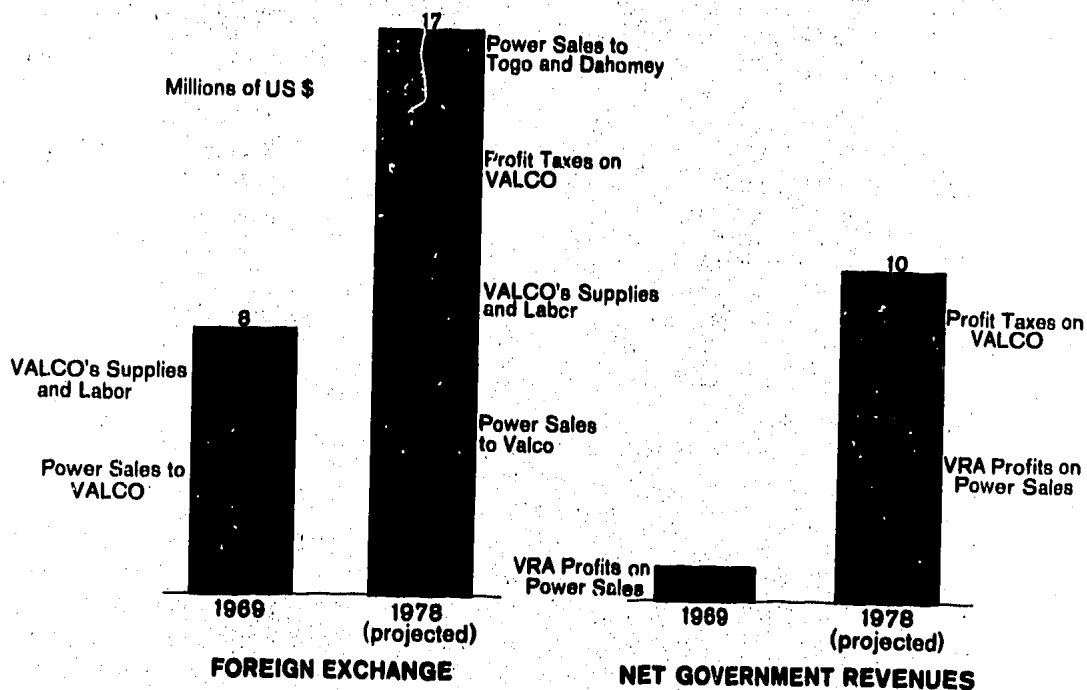
12. When Ghana was assured by the World Bank and the US and UK governments of financial assistance for the publicly financed dam and infrastructure, the viability of the entire Volta River Project then depended on the project's aluminum phase. Without the proposed smelter, the hydroelectric development could not be justified. The pressure on Accra to come to terms with the VALCO firms thus was considerable. Many aluminum companies had earlier lost interest because world demand for aluminum slackened dramatically in the mid-1950s and because President Nkrumah had made the Volta project the *sine qua non* of Ghana's emergence as a modern state. The problem was that the two aluminum companies that had entered into the negotiations saw no critical need either to develop the bauxite reserves or to build a smelter: world bauxite reserves were enormous, and there were a number of sites for hydroelectric and aluminum plants outside Ghana. Major tax and other financial concessions by Ghana were necessary, therefore, to reach agreement. VALCO was granted freedom from duty on alumina imports and aluminum exports until 1997 and exemption from income taxation for about a ten-year period. In the late 1970s the foreign exchange earnings forgone as a result of these concessions may

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Foreign Exchange and Net Government Revenues from the VRP

Figure 4

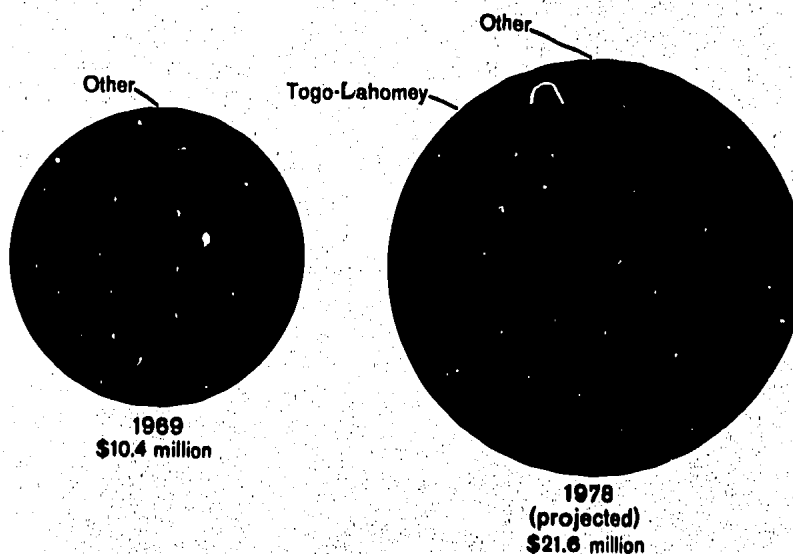


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Current and Projected Revenues from Sales of Volta Electricity

Figure 5



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amount to as much as \$9 million a year -- more than half of the \$17 million now expected to be earned in 1978.

13. Perhaps the most important concession Ghana made was to abandon its demand for a firm commitment on the part of Kaiser-Reynolds to install an alumina plant (by 1975, as once expected); in terms of foreign exchange earnings to Ghana, this probably would have been worth about \$7 million annually. A major goal of the plan had been to convert local bauxite into alumina for the VALCO smelter. In the negotiations, however, Kaiser-Reynolds convinced Accra to postpone the alumina plant and use imported alumina instead.*

14. Another major concession made by Ghana was the exceptionally low price charged VALCO for electricity -- \$0.002625 per kilowatt hour until 1997. This price covered only the operating costs of the dam, debt servicing, and depreciation. There is no allowance for profit. The rate is one of the lowest paid by Kaiser smelters around the world. These prices range from \$0.00175 per kilowatt hour to \$0.0055 per kilowatt hour. At an early stage of bargaining, Nkrumah had suggested a price of \$0.0045, and World Bank studies established the preferred price at \$0.0035 for viable operation of the project's power phase. At this latter rate, annual sales receipts from VALCO would be \$2 million more than the \$5 million now received. Thus \$2 million annually is a reasonable measure of Ghana's loss resulting from the price concessions.

Lost Irrigation Development

15. Ghana's lackluster economic performance has thwarted plans to diversify agriculture by using Lake Volta water to irrigate the Accra Plains in southern Ghana. At present, 95% of agricultural export revenue comes from cocoa. A \$10 million investment in irrigation could promote mechanized sugar cane production worth \$16 million annually,

* Almost all of VALCO's alumina imports come from Kaiser's 26% share of the 950,000 ton ALPART plant in Jamaica.

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twice the amount now spent yearly on sugar imports. An alternative plan involves a larger investment, including a substantial foreign exchange component, to produce rice. In view of its high unemployment and difficult foreign debt problem, however, Ghana currently favors developing labor-intensive agriculture using domestic resources.

Prospects for the Volta River Project

Foreign Exchange

16. Foreign exchange earnings from the project will more than double in the 1970s as a result of greater sales of electricity to VALCO, the start of sales to neighboring countries, higher levels of supplies and labor at VALCO, and the end of the tax holiday on VALCO's profits. By 1978, Ghana can expect to earn about \$17 million annually in foreign exchange from the Volta River Project.

17. Ghana's benefits from VALCO will increase in 1972 with the addition of a fourth potline. Expansion of the smelter will boost VALCO's electricity requirements one-third to 315 mw and will generate an additional \$1.7 million of foreign exchange annually (see Table 2). The corresponding increase in both employment and local purchases of materials at VALCO will add about \$1 million more. Consequently, the expansion will raise Ghana's foreign exchange receipts from \$8 million to about \$11 million.

18. Ghana will start collecting profits taxes from VALCO probably in 1977 at the rate of 40% of retained earnings and 2.5% of repatriated profits. According to the power agreement, taxes are payable in the year when cumulative profits equal the capital invested by Kaiser and Reynolds, or after a ten-year tax holiday, whichever occurs first. Profits are expected to reach the specified amount in 1977, which also represents the end of the tax holiday. At this time, Ghana will start collecting about \$4 million annually (see Figure 4).

19. Near-term prospects for construction of an alumina plant to process local bauxite appear dim. Although Ghana has large bauxite deposits in the Eastern, Western, and Ashanti Regions (see

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Table 2
Revenues from Sale of Volta Electricity

	Million US \$					
	Actual			Forecast		
	1969	1970	1972	1974	1976	1978
VALCO	5.2 <u>a/</u>	5.2 <u>a/</u>	6.0 <u>a/</u>	6.9 <u>a/</u>	6.9 <u>a/</u>	6.9 <u>a/</u>
Electricity Corporation	3.7	5.0	6.6	8.6	9.8	10.9
Mines	1.3	1.4	1.4	1.5	1.5	1.5
Akosombo township	0.1	0.2	0.2	0.1	0.1	0.2
Akosombo textiles	0.1	0.1	0.2	0.2	0.2	0.2
Togo and Dahomey	-	-	0.2 <u>a/</u>	1.0 <u>a/</u>	1.6 <u>a/</u>	1.9 <u>a/</u>
<i>Total</i>	10.4	11.9	14.6	18.3	20.1	21.6

a. Foreign exchange.

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Figure 3), only the Awaso deposits in the Western Region are being mined.* The Kibi deposits in the Eastern Region, some 50 miles northwest of the VALCO smelter at Tema, contain proved reserves of about 88 million tons of medium-grade bauxite. Kaiser estimates that an alumina plant in this area large enough to supply VALCO's future needs of 330,000 tons per year would cost about \$100 million and that the associated infrastructure and mine (660,000 tons per year) would cost another \$50 million to \$75 million. Initially, Kaiser considered a much larger alumina plant -- involving a capital investment of about \$350 million -- with the excess alumina being exported to the company's other smelters. Negotiations between Kaiser and the Ghana government, although continuing, apparently have been marred by the inability to agree on the plant's size. Kaiser appears unwilling, however, to construct any plant as long as its Jamaican and other facilities are adequate. Concurrently, therefore, Ghana is negotiating with a consortium of foreign firms representing Canada, the United Kingdom, Romania, and the Netherlands as well as with interested Japanese aluminum manufacturers.

20. An important aspect of the Volta River Project not foreseen by the original planners, but which will earn about \$1 million in foreign exchange by 1974 and \$2 million by 1978, is the present arrangement to export electricity to Ghana's eastern neighbors, Togo and Dahomey. A 15-year accord signed late in 1969 will place 50 mw at their disposal in 1972 when the installation of the fifth and sixth 147 mw turbines at Akosombo is completed. Transmission facilities are being financed by an \$8.5 million loan from the Canadian International Development Agency. When completed, the transmission grid is expected to start supplying both Togo and Dahomey with enough electricity to meet their anticipated needs for more than a decade.

* Exports from this mine, averaging 318,000 tons per year in the period 1965-69, are shipped by the British Aluminum Company to its plants in Scotland.

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21. The long-term revenue prospects for the VRA are quite favorable. Revenues from the sale of Akosombo electricity -- more than \$10 million in 1969 -- are expected to reach \$22 million by 1978 (see Table 2). While current net returns are small, the VRA will realize annual net profits of \$6-\$7 million and a rate of return of 9%-10% by the mid 1970s (see Figure 4). The VRA's sales of electricity are expected to surge because of an anticipated 8%-10% annual growth mainly in light industry in the Accra and Tema industrial areas, now served by the 500-mile, 161-kilovolt transmission loop from the Akosombo dam (see Figure 3). Both Accra and Tema are expected to accelerate overall consumption of electricity in the 1970s, with Accra doubling and Tema tripling requirements by 1978. However, the Akosombo contribution to this surge will taper off by 1976 (see Table 3), when Ghana will have to turn to other sources of electricity for future expansion.

Conclusions

22. The major elements in Ghana's Volta River Project, the Akosombo hydroelectric development and the foreign-owned VALCO aluminum smelter at Tema, have been in operation since 1965 and 1967, respectively. Both will expand in the next two years. Akosombo's reserve capacity can accommodate sizable industrial and urban growth until 1976, and the dam is likely to provide \$6-\$7 million in annual profits by the mid-1970s. By 1978 the entire project should be contributing about \$17 million annually in foreign exchange to the government. Such earnings are relatively small, however, in view of Ghana's need to meet external debt payments that may average \$50 million annually through the 1970s. These debt payments preclude the use of export proceeds to stimulate Ghana's lagging economy.

23. In all likelihood, moreover, the full potential of the Volta River Project will not be realized within the present decade. If VALCO

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were to become part of a fully integrated aluminum industry using local bauxite as originally planned, then annual foreign exchange earnings could be increased by about \$7 million -- but such a development is unlikely in the short run. The Accra Plains irrigation plans, too, have been shelved in favor of less highly capital-intensive agricultural projects.

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Table 3
Power Supply of the Volta River Authority

	Actual		Projected			
	1969	1970	1972	1974	1976	1978
Power requirements (megawatts)	190	414	556	603	646	678
VALCO	245	240	315	315	315	315
Electricity Corporation	97	120	162	197	216	236
Mines	32	33	33	34	34	34
Akosombo township	3	5	5	3	4	6
Akosombo textiles	2	4	6	6	6	6
Togo and Dahomey	-	-	16	23	40	48
Transmission losses	11	12	19	25	31	33
Capacity a/						
Number of units	3	3	5	5	5	5
Megawatts	384	384	640	640	640	640
Surplus or deficit						
Capacity (megawatts)	-6	-30	84	37	-6	-38

a. Based on one unit in reserve and the remaining units operating at nominal output of 128 megawatts per unit rather than the over-head capability of 140 megawatts.

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